Exercise No: 2.2

Question 1:

Find the value of the polynomial $5x – 4x^2 + 3$ at

(i) x = 0

(ii) x = -1

(iii) x = 2

Solution:

(i)

Let $f(x) = 5x – 4x^2 + 3$

For x = 0, we will put the value of x as 0 in the polynomial.

$f(0) = 5(0) – 4(0) + 3$

$= 3$

So, the value of the polynomial at x = 0 is 3.

(ii)

Let $f(x) = 5x – 4x^2 + 3$

For x = -1, we will put the value of x as -1 in the polynomial.

$f(-1) = 5(-1) – 4(-1)^2 + 3$

$= - 5 – 4(1) + 3$

$= - 9 + 3$

$= - 6$

The value of the polynomial at x = -1 is – 6.

(iii)

Let $f(x) = 5x – 4x^2 + 3$

For x = 2, we will put the value of x as 2 in the polynomial.

$f(2) = 5(2) – 4(-2)^2 + 3$

= 10 – 16 + 3

= - 3

Question 2:

Find p (0), p (1) and p (2) for each of the following polynomials:

(i) $p(y) = y^2 – y + 1$

(ii) $p(t) = 2 + t + 2t^2 – t^3$

(iii) $p(x) = x^3$

(iv) $p(x) = (x – 1)(x + 1)$

Solution:

(i)

$p(y) = y^2 – y + 1$

Substitute y = 0,

$p(0) = (0)^2 – (0) + 1$

= 1

Substitute y = 1,

$p(1) = (1)^2 – (1) + 1$

= 1 – 1 + 1

= 1

Substitute y = 2,

$p(2) = (2)^2 – (2) + 1$

= 4 -2 +1

= 3

(ii)

$p(t) = 2 + t + 2t^2 – t^3$

Substitute y = 0,

$p(0) = 2 + 0 + 2(0)^2 – (0)^3$

= 2

Substitute y = 1,

$p(1) = 2 + (1) + 2(1)^2 - (1)^3$

$= 2 + 1 + 2 - 1$

$= 4$

Substitute y = 2,

$p(2) = 2 + 2 + 2(2)^2 - (2)^3$

$= 2 + 2 + 8 - 8$

$= 4$

(iii)

$p(x) = x^3$

Substitute y = 0,

$p(0) = (0)^3 = 0$

Substitute y = 1,

$p(1) = (1)^3 = 1$

Substitute y = 2,

$p(2) = (2)^3 = 8$

(iv)

$p(x) = (x - 1)(x + 1)$

Substitute y = 0,

$p(0) = (0 - 1)(0 + 1)$

$= (-1)(1)$

$= -1$

Substitute y = 1,

$p(1) = (1 - 1)(1 + 1)$

$= 0(2) = 0$

Substitute y = 2,

$p(2) = (2 - 1)(2 + 1)$

$= 1(3)$

= 3

Question 3:

Verify whether the following are zeroes of the polynomial, indicated against them.

(i) **$p(x) = 3x + 1, x = -\frac{1}{3}$**

(ii) **$p(x) = 5x - \pi, x = \frac{4}{5}$**

(iii) **$p(x) = x^2 - 1, x = -1, 1.$**

(iv) **$p(x) = (x + 1)(x - 2), x = -1, 2.$**

(v) **$p(x) = x^2, x = 0$**

(vi) **$p(x) = lx + m, x = -\frac{m}{l}$**

(vii) **$p(x) = 3x^2 - 1, x = \frac{-1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$**

(viii) **$p(x) = 2x + 1, x = \frac{1}{2}$**

Solution:

To check whether the given values are zero or not we will put them in the place of x in the respective polynomials.

(i)

p (x) = 3x + 1, now here $x = -\frac{1}{3}$ as the zero, so we will put it at the place of x,

$p(-\frac{1}{3}) = 3(-\frac{1}{3}) + 1$

$= -1 + 1 = 0$

This shows that the given value is the zero of the polynomial.

(ii)

$p(x) = 5x - \pi$, here $x = \frac{4}{5}$ so we will put this value in place of x,

$p(\frac{4}{5}) = 5(\frac{4}{5}) - \pi$

$= 4 - \pi$

This shows that the given value is not the polynomial as it is not giving 0.

(iii)

$p(x) = x^2 - 1$, here two values of x are given, which are -1 and 1, we will put them in the polynomial,

$p(-1) = (-1)^2 - 1$

$= 1 - 1 = 0$

$p(1) = 1^2 - 1$

$= 1 - 1 = 0$

This shows that both the values are zeroes of the polynomial.

(iv)

$p(x) = (x + 1)(x - 2)$, here we have been provided with two values of x and that are – 1 and 2

$p(-1) = (-1 + 1)(-1 - 2)$

$= 0(-3) = 0$

$p(2) = (2 + 1)(2 - 2)$

$= 3(0) = 0$

This tells us that both the values are zero of the polynomial.

(v)

$p(x) = x^2$, here we have the value as 0, so we will put that in the polynomial.

$p(0) = 0^2 = 0$

Thus, the given value is the zero of the polynomial.

(vi)

$p(x) = lx + m$, the given value is $-\frac{m}{l}$, so we will check the value.

$P(-\frac{m}{l}) = l(-\frac{m}{l}) + m$

$= - m + m = 0$

Thus, the given value is the zero of the polynomial.

(vii)

$p(x) = 3x^2 - 1$, there are 2 given values for this polynomial and that are $-\frac{1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$

Now, $p(-\frac{1}{\sqrt{3}}) = 3(-\frac{1}{\sqrt{3}})^2 - 1$

$= 3(\frac{1}{3}) - 1$

$= 1 - 1 = 0$

$p(\frac{2}{\sqrt{3}}) = 3(\frac{2}{\sqrt{3}})^2 - 1$

$= 3(\frac{4}{3}) - 1$

$= 4 - 1 = 3$

So, from this we can see that the value $-\frac{1}{\sqrt{3}}$ is the zero of the polynomial, but the value $\frac{2}{\sqrt{3}}$ is not the zero of the polynomial.

(viii)

$P(x) = 2x + 1$ and the given value is $\frac{1}{2}$, so,

$P(\frac{1}{2}) = 2(\frac{1}{2}) + 1$

$= 1 + 1 = 2$

This shows that the given value is not the zero of the polynomial.

Question 4:

Find the zero of the polynomial in each of the following cases:

(i) p(x) = x + 5
(ii) p(x) = x – 5
(iii) p(x) = 2x + 5
(iv) p(x) = 3x – 2
(v) p(x) = 3x
(vi) p(x) = ax, a ≠ 0
(vii) p(x) = cx + d, c ≠ 0, c, d are real numbers

Solution:

To find the zero of any of the polynomial the best way is to equate it with 0, we will see in the following solution.

(i)

P(x) = x + 5

Here, we will equate the equation by 0 and find the zero of the polynomial.

0 = x + 5

x = - 5

In this way we can find the zero of the polynomial and in this case x = - 5 is the zero of the polynomial.

(ii)

P(x) = x – 5

In this case we will equate the polynomial with 0.

0 = x – 5

x = 5

The zero of the polynomial is x = 5.

(iii)

P(x) = 2x + 5

We will equate the polynomial with 0

0 = 2x + 5

- 5 = 2x

$-\frac{5}{2} = x$

The zero of the polynomial is $x = -\frac{5}{2}$.

(iv)

P(x) = 3x – 2

Equating the polynomial with 0.

0 = 3x – 2

2 = 3x

$\frac{2}{3}$ = x

The zero of the polynomial is x = $\frac{2}{3}$

(v)

P(x) = 3x, in this case when we will equate the polynomial with 0,

0 = 3x

x = 0

The zero of the polynomial is x = 0.

(vi)

P(x) = ax, a ≠ 0, here we will equate the polynomial with 0 to find the zero,

0 = ax

$\frac{0}{a}$ = x

x = 0

The zero of the polynomial occurs at x = 0.

(vii)

P(x) = cx + d, c ≠ 0 and c , d belong to real number , now we will equate the polynomial,

0 = cx + d

- d = cx

$-\frac{d}{c}$ = x

So, the polynomial has zero at x = $-\frac{d}{c}$.